¶ An Apollogie confirmation explanation and Addition to the *Vranicall Aſtrolabe* by the *Author.*

FIrſt for *Apollogie* and *Confirmation* of the thinge I doe not ſee but I may well (without flattering or ouermuch affecting my owne doinges auouch it to be the beſt & rareſt deuiſe for an Aſtrolabe that euer came forth in any age, & to moſt vſe & pleaſure, and do wiſh any man that thinketh hee can contradict it to doe it in writing that I may eyther yeild or aunſwere. For, to backbyte or detract by wordes any man that hath openly publiſhed himſelfe by writing is neyther honeſt nor credible, rather it bewrayeth himſelfe to bee eyther partiall, malicious, ignorante, or vaineglorious. But to the matter I ſay for an Aſtrolabe not comparing it (though the deuiſe be more new & rare) with the *Catholicon* or *Iewell*, which contayneth in it the ſeuerall vſes, not onely of all Aſtrolabes but alſo of the Sphere and Globes themſelues, and of all other Inſtruments both *Aſtronomicall* and *Geometricall*, being fitted accordingly as hereafter if God permit I will yet more maniſeſt. Therefore very vnaptly by *Gemma Friſius* named *Aſtrolabum Catholicon* had he not added thereunto in his title. *In quo quicquid vſpiam rerum mathematicarum tradi poſſit continetur &c.* And for that cauſe I hauing amplyfied the deuiſe both in faſhion & vſe, named it the *Mathematicall Iewell* But to ſet ſorth an Aſtrolabe: and no more but an Aſtrolabe; then I ſay, that this and no other is *Aſtrolabium Catholicon* or *Generale*. Which muſt needes be confeſſed, if with *Meſſahala* we do but define the word *Aſtrolabe* who (as *Io. Stophlerus* reporteth) ſayth, that *Aſtrolabium eſt nomen grecum cuius Interpretatio eſt acceptio ſtellarũ.* In latin it is called (as *Stophler* ſaith) *Aſtrolapſus: quaſi aſtrorum caſus vel lapſus, vel quia metitur lapſus vel tranſitus aſtrorum et ſignorũ.* Wherefore ſeeing it appeareth by the diffinition of the name; that the very Intendement of the deuiſe of the Aſtrolabe, was but to comprehende the lapſes, courſes, riſings, and ſettings of the ſignes, ſtarrs, and planets, vnto the ſundry Horizons in ſeuerall countries and latitudes: and no further. All which this my *Vranicall Aſtrolabe* ſo effectually, ſo plauſibly, ſo pleaſingly, ſo eaſily, and ſo ſufficiently performeth. That (the round globe it ſelfe excepted) neyther the *Iewell*, neither any other deuiſe of Aſtrolabe either generall or particular, of which many haue been, and with great ioy and applauſure heretofore receiued, cõmeth any way neere it. Therefore I can not ſee howe or with what face any man can iuſtly detract from it. Let me here examine the matter publicquely, and to make ſhort & come ſpeedily to the point omitting ſuch horoſcopes as *Apian* & others publiſhed with their cylinders ſhipps, rings, & many other learned *Ludicra* & deuiſes in dyalls framed for the riſing and ſetting of the ſignes & ſtarrs, and leauing out ſuch Aſtrolabes as old *Sconer* and diuers other did ſet foorth which weare neuer much accompted of, and ſtraight iumpe in with that high cõmended and ſo euer wel accepted Aſtrolabe, euen the very foundatiõ of al that haue been ſince which *Io. Stophlerus* laſt eſtabliſhed in his booke *de Fabrica et vſu Aſtrolabij*. euen that *Aſtrolabe* without which on the backſide, *Gemma Friſius* woulde not allowe his *Catholicon* currant: although in my Iewell I ſupply it on the face, and that more generall. Well then, if you throughly conſider of, or looke into that ſo excellent deuiſe: whether to a particular Horizon as *Io. Stophlerus* framed him: or generall to all *Horizons* as *G. Friſius* appointed him: or more general to al Horizons & both Poles, as my ſelfe in my Iewell deuiſed him: yet by all thoſe deuiſes, in regard that of a 1000. ſtarrs & vpwards wel known & recorded by Images in the heauẽs conceiued, there could be no vſe of aboue 40. or 50. of them. & that vſe halfe purblind for wãt of the Images. And that in this *Vranicall Aſtrolabe* there is equal vſe of the whole trope & of euery Image & conſtellatiõ in his full proportiõ, as plaine as the day to be ſeene: a few to wards the South pole which with vs are neuer ſeen excepted: and that many more Aſtrolabicall propoſitiones are to be performed thereon, generall to al Horizõs, then before could be done by that of *Stophlers* to one Horizon. Therefore I can not but moſt confidẽtly defend, confirme, and preferr the deuiſe thereof before thẽ all in his kinde. And adding another face thereunto, for thoſe few cõſtellations wãting & cõſidering the ſmall charge, the eaſie portabillity & the readines of vſe (for which 3. cauſes the Aſtrolabe was firſt deuiſed & euer accompted of) it might ſeeme a deuiſe now ſprung vp to put downe the globe it ſelfe. Add to theſe my newe deuiſe of the *Horarium Planetarium* on the top theareof, many waies before attempted, yet neuer made generall before: alſo the deuiſe in the two ſide ſemicircles (wheare once I had thought to haue placed the ſaid ſouth cõſtellations wãting) for equating & rectifiyng of the fixed ſtarres, for all ages, paſt and to come: neuer ioyned to any other Aſtrolabe. Theſe I hope may ſatisfie for an Appollogie & confirmatiõ of the deuiſe; yf not: Sure I am, they maye make you looke a Tearme or two longer for my *Organum Vranicum* thẽ I promiſed, becauſe I meane once againe to peruſe & write ouer the coppy perceauing by this that the Incorporating of thexamples with the precepts, which I vſed here and thought hereafter more to vſe for breuity of wryting, wil make the more prolixitie of vnderſtādīg for yong practiſers. Vnto whom, my harſh looſe & deliuer of that I conceaue, (nature affoording me no better) I perceiue is of it ſelfe hard inough: which as I am ſorie for, ſo haue I been alwaies willing, as I haue ſtill offered & that *gratis, viua voce* to remedie it, as diuers by experience can teſtifie.

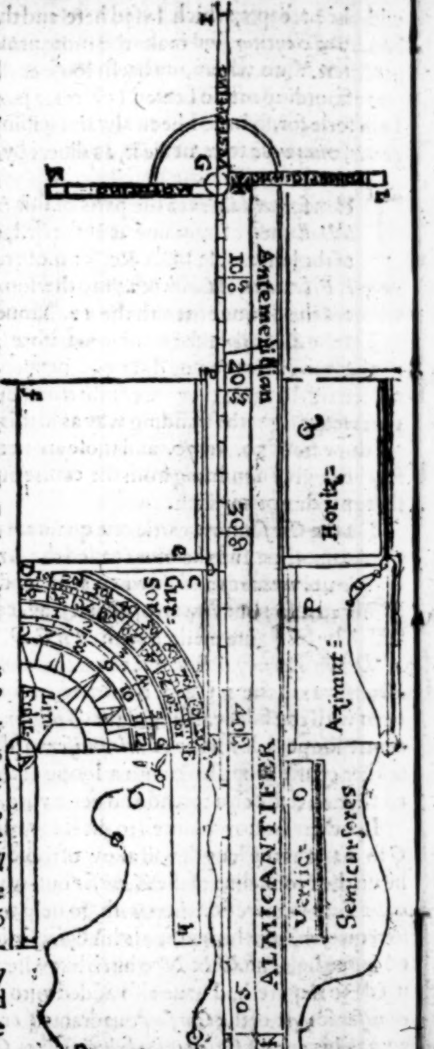
THen for *Addition* to the parts of this Aſtrolabe, let the *Mater* or *Celeſtiall* thereof remaine as at the firſt, onely I thinke good in ſteede of the letters I. F. M. A &c, for more readines to write the words *Ianuarie, Februarie, March* &c. vnto the ſame places of the *Ecliptick* circle whereas the Sonne entereth the 12. Monethes of the yeare.

Let the *Zenitfer* alſo remaine as before ſauing that, I would not haue the hower-circle thereon diſcribed, neyther any numbers written in capitall letters, becauſe they are comberſom, but in ſteede of them ſmaller figures ſet vpright the ſtanding way as in this figure of the Almcantifer you ſee done from 50. to 70. and thoſe are needefull, but in the Noone lyne for the double numbring from the centre out-wards, but in the North line there neede not any ſuch.

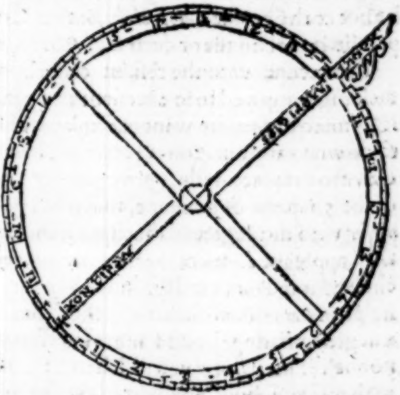
Let the *Curſor* now carrie one quadrant of 90 deg. ſeruing chieflye for the Azimuthes, and therefore called the Azimuthall quadrant, numbred double *vz.* vpwards and downewards, and another of 6. howers double numbred alſo: but vpwards, al one way, called the hower quadrant: all which by his figure marked with *A B C D*, you may here ſee whoſe line *A D* is his fiducyall line which muſt alwayes run verye ſquare croſſe the *Zenitfer* as in the 1. Chap. is ſhewed, his line *A B* keeping in that motiō euen with the fiducyall line of the *Zenitfer*, at whoſe point *A* muſt be a centre loope hole for the *Almicantifer* to play vpon. And at *B* let be another centre loope hole with a loope of thread, or a hooke alwaies fixed therein to hitch a thread and perle vnto, when neede requireth.

Let there be now planted to the fiducyall line of the *Almicantifer E P G* ſo many as the length will allow of thoſe radiall degrees which ſhould be on the Nooneline of the *Zenitfer* out-wards from the croſſe + or *Æquinoctials* interſection therewith, to help to lēgth the *Zenitfer* whē cauſe ſo requireth, for which purpoſe his *Oſtenſor* or pointer hath now two centre loope holes at *M* & *N* to hitch likewiſe a thred and pearle vnto when neede ſo requireth. I haue alſo added vnto the centre end *G* of the *Almicantifer* for vſe of the *Curſors* quadrants 3 croſſe finnes. So that there are now to his centre *G*: 4 croſſe fiducial lines *G K. G I. G L*, & *G P*. of which *G P*. and *G I*, are ſome-what the longer & doe anſwere in length to the outer numbers of the Azimuthall quadrant, And *G L* & *G K* ſom-what the ſhorter aunſwering, but the inner numbers thereof. And all 4 ſerue alike to the hower quadrant. But in all; with this diſtinctiō that whe n *G P F* the fiducyal line of the *Almicantifer* (which is as the *Index* to the other three) commeth on either of thoſe quadrants be ſure the hower or *Azimuth* ſhewed is *Antemeridiā* vz. betweene 6 of the clocke in the morning & noone. And when the moouing about or application of the line *G P F* vnto any ſtarr, planet, or point in the Celeſtiall, cauſeth *G L* to come on thoſe quadrants, thē be ſure the hower or *Azimuth* is *Pomeridian* vz. beetweene noone and 6 of the clocke at night. And when *G K* cōmeth on: then *Nocturnall* or *Veſpertine*, vz. betwene 6. at night & midnight. And when *G K* cōmeth on, then *Matutine* or towardes the morning vz. betweene midnight and 6 in the morning according to which I haue in them placed the 4 wordes *Antemeridian*, *Pomeridian*, *Veſpertin*, and *Matutyn* for eaſe of memorie.

Alſo I would nowe haue euen for eaſe as much as for vſe three narrowe Curſors *O P* & *Q* which may bee called lydgers rather then Curſors, to be planted for all queſtions of one latit. euen fixed on the *Zenitfer*: the one at the verticall point in the Noonelyne, the other at the *Horozontall* poynte in the North lyne, the other at the *Azimuthall* poynt in the North line alſo, which poynte is alwayes twiſe ſo many radiall degrees frō the centre as the latitude of your place amounteth vnto and was not mentioned any where in the Booke: and the Verticall and Azimuthall lydgers to haue each a centre loope hole to hitch a thread and pearle vnto, when cauſe requireth.



Laſtly you ſhall deſcribe the hower circle (which before was plãted on the *Zenitſer*) now on a plate or plaine by it ſelfe hauing a ſhort *Index* at 12 of clocke at noone from which you ſhall (after the *Copernitian* mãner) nũber the afternone howers 1 2 3 &c. leftwards towards the Eaſt as by this figure you ſee. This hower circle muſt bee planted on the cẽtre of the Celeſtiall to moue ſtiflly vnder the *Zenitſer* with a bolſter betweene the *Zenitſer* and it: that the mouing of the *Zenitſer* do not ſtirre it.



NOw to the Explanation which me thinks ſhould not nede any vntil paſt the firſt 12 chapters becauſe thoſe cõtaine nothing but what is cõmon in euery Aſtrolabe in a mãner: moſt eaſie to be vnderſtood of any that hath read but the firſt principles of the globe or ſpeare, For al the Excẽtrick circles of the Mater, vz. ſuch as are not deſcribed on the centre of the *Celeſtiall* or *Mater* of the *Aſtolabe*, are no other (as in the 2 *cap.* is ſayd) but thecliptick circle of the Zodiack marked with *BC*, with euery fiſt of his circles of lõgitude, diſtinguiſhing the whole face into the 12 ſignes & their parts, yſſuing frõ his poles: and euery fift of his parallel circles of latitude, paſſing on ech ſide towards ech of his poles, or ſo many & ſo much of thẽ as the proiectmẽt wold allow, which admitteth but one of the Zodiacks poles within it marked with the letter *D*. And theron is only the *Æquinoſt.* circle deſcribed cõcentrick cutting thecliptick at the beginnings of *Aries* & *Libra* at *B* & *C*, whoſe nũbers & deuiſiõs becauſe they ſhould not diſturbe the *Mater*, are ſet in the outer limbe thereof: where note that *B* ſtãdeth at the tip of the taile of *Cetus*, *C.* in the right wing of *Virgo*, *D* vnder the foote of *Draco* though ſome hath ſaid there be no ſuch letters. And now, who can not eaſily by the ſquares made with the croſſings of thoſe circles of long. & latit. eaſily deſcrye the lõgitudes & latitudes of any ſtar, careĉt, or conſtellatiõ thereon ſet or drawẽ as in the 2 *cap.* is taught. And ſeing the centre of the *Aſtrolabe* marked with *A*, repreſẽteth the north pole of the world about which the *Zenitſer* moueth, The radiall degrees of whoſe nooneline are nũbered frõ *thequinoctialls* interſectiõ, where the + ſtãdeth either way towards ech pole, Who cã be ſo ignorant but to know that by the leading about thereof by the degrees of the *Maters* limbe, that his fiducyall or noone-line maye ſhewe the 360 *Meridians* of the globe, though to auoyde confuſiō of lines they be not drawē on the *Aſtrolabe*, & that his radial degrees do lymit out the parallelles of latitude or declinatiō frō *thequinoctiall* by that leading about.

But to come vnto the reſidue of the booke wherein our newe deuiſed tackling is applyed to ſo excellent vſes generall to all *Horizons*: which as it ſeemeth hath more want of Explanation. The firſt thing you haue now to do when any queſtion is propoſed, is to ſet the *Index* of the hower circle vnto the place of the ☉, for the day or time of your queſtion by helpe of the 5 *cap.* the & noneline, that is to ſay bring the nooneline of the *Zenitfer* vnto the degree of thecliptick aunſwering your daye propoſed, and then apply the *Index* of the hower-circle euen therewith, ſo is the hower circle planted for that day, and in like ſort you ſhall from day to daye by helpe of the nooneline remoue the *Index* further & further for euery day a degree rebating the odd minuts in the 5 *cap.* mentioned. So ſhall the nooneline now ſhew you ſtill theron the hower in euery queſtiō vnaſked as they ſay without labelling to the ſon, as in moſt chapters of the booke was vſed, although he that deſireth variety may now vſe both: For the *Amicantifer* labelled frō the cētre of the *Aſtrolabe* vnto the Sonnes place in thecliptick as in the booke is vſed, either it ſelfe or one of his three croſſe finnes ſhall ſhew yow the hower in the hower quadrant of the *Curſor*, ſo you take thoſe hower numbers which fit vnto the directiō of the fin written thereon: that is to ſay, if the *Matutine* or *Pomeridian* fin come thereon then the numbers from 1 to 6 muſt ſerue: if the *Antemeridian* or *Veſpertine* then thoſe frō 6 to 12.

The ſecond thing moſt materiall to be done is as in the 10 & 17 *cap.* I indeuoured to ſhew to chuſe out on the *Zenitfer* the pointes & lines appertaining to your latitude, *Horizon*, or place of your abode, & to prepare him with his furniture to the *Horizon* of that place: Which hauing nowe foure *Curſors* you ſhall doe & vnderſtand I hope with eaſe. And for more facilitie as well in working as nūbering, you ſhall reiect the odd minutes of your latitude, if any happen, and worke vpon the neereſt entire degree as in all auntiēt *Aſtrolabes* the vſe euer was vntill practiſe hath made you more perfect for the minutes. For example, to prepare the *Zenitfer* to the latitude & *Horizon* of *Reading*, where the latit. or poles eleuatiō is by the 10 *cap.* to be found about $51\frac{1}{3}$ *deg.* you ſhall in ſteed of $51\frac{1}{3}$ take 52 *deg.* and accompt that for our latit. neglecting the od 20 min. which for commō vſe wil hurt little. Wherefore you ſhall ſeeke out this latit. 52 amonge the radiall degrees of the nooneline, where I haue in this figure ſet *E*, &

thereto

there to plant the fiducial line of your Verticall lidger in the former figure marked with *O*. Thē likewiſe ſeke the ſame 52 latit. amōg the radial *deg.* of the North line where I haue ſet *R*, & there to plāt the *Horizontall* lidger *Q*. And between thoſe 2 lidgers thus placed you ſhal euer find *90*. radial *deg.* of the *Zenitfer* as if you tel thē with a ſtick as they ſay you may eaſily try, now the 20 min: be reiected, & thoſe *90* ra. deg. are the 90 interſectiōs of the *90* Almicātares with the North quadrāt of the Meridiā in euery latit. & therfore I cal thē the North deg. Thē ſeke out twiſe 52 deg. vz. 104 degrees in the Northline reckoned frō the cētre outwards which will fal out at 14 *deg.* without the +, where I haue ſet *X* and there plante the *Azimuthall* lydger *P*. And theſe 3 thus planted ſhall neuer be ſtirred ſo long as you keepe in the 52 latit. Then to proceede further if now you follow the fiducyall line of the Verticall lydger thus plāted croſſe the *Zenitfer* frō *E*, you ſhal perceiue it of it ſelfe, to finde out & touch the *Zenith* point of your latitude, that is to ſay, the innermoſt end of that *Zenith* line which appertaineth to the 52 latit. marked with *F*, whoſe outer end is marked with *B*, this line *B F* is the *Zenith* line of the 52 latit. & all the reſt of his fellowes are of no vſe in that coūtry, yet is he ioyntly with them deuided by the croſſe ſlope lines which you ſee into 90 parts, though vnequall which are as in the 1 *cap.* is ſayd, the *90* Almicantar roots that is to ſay out of theſe *90* roots ſeuerally doth ſpring the *90* ſeuerall *Almicantares* or circles of altitude of the 52 latit. which roots are eaſily reckoned by the vpright numbers ſet in the left margēt vnto euery 10 of them. And becauſe theſe roots begin frō the outer- moſt ends, & thence are nūbered inwards, therefore the point *B* being the outer end of the 52 *Zenith* line, is the roote of the firſt or 0 Almicantare of this 52 latit. which in dede is alwaies the *Horizon* it ſelfe. For the Almicantares begin frō the *Horizon* & thēce grow leſſe & leſſe til they come to nothing at the *Zenith*, as the parallells grow frō *thequinoctiall* to the pole, where they end at *90*, ſo that euer the *Horizō* circle is the firſt or 0 Almicātare. This wel vnderſtood thē ſhal you ſet the fiducial line *A D* of the Curſor euen with the point *B* on the *Zenitfer* & there plāt him faſt with a ſcrew pin, if your work be of mettal & ſo ſhal he cut the noneline at *A*, thēce apply the fiducial line *G F* of the *Almicātifer* in the former figure euē with the noone line, & therō ſlide downe the finger of the pointer til it touch the *Horizontall* lydger at the point *X* there ſcrew faſt the pointer alſo. Laſtly you ſhall frō the point *X* where the *Azimuthall* lidger reſteth extēd his thread euē with the noone line, & there ſlide vp the perle til it touch the Verticall lidger at *E*, & there knit the pearle faſt with a knot neuer to be ſtirred in the 52 latit. And ſo at the laſt (your three lidgers thus placed at *E R* & *X* & the Curſor to *B A* & the pointer diſtant from *A* according to the quantitie *A R* & the perle from *X* according to *X A*) your *Zenitfer* is prepared to the *Horizon* of this 52 latitude, which being done (once for all as they ſay) performeth al the Chapters of the booke without any altering or remouing, ſome 2 or 3 Chapters excepted, for which the *Curſor* onely is to be remoued but none of the reſt, and therefore in regarde thereof the labour is ſhort though it ſeeme long.

The *Zenitfer* thus prepared to the *Horizon* of the 52 latitude & the Howercircles *Index* ſet to the ☉ as before, for the day and time propoſed, you may then preſently euen with one bare inſpection ſee almoſt halfe the cõcluſions of the booke performed without any labour at all more then to apply the nooneline vnto that planet carrect or ſtarre which you meane to worke vpon.

Example: the 5 day of Marche 1598. proceeding as in the 5. *cap.* is taught, you ſhall finde the ☉ his place in thecliptick 25 degr. 3 min. in ♓ thereto dyrect the *Index* of the hower-circle by helpe of the Noone-lyne. Where let him reſt fixed for all that day, ſo haue we no more troble with that part. And now will we here worke vppon the great ſtarre of the firſt magnitude which you ſee in the face of *Taurus* cõmonly called *Paliliciũ Aldebaram* or *Oculus tauri* to knowe his ſtate in the heauens. His longitude is eaſily deſcryed as in the 2 *cap.* is ſhewed by the circles deſcribed on the Celeſtiall, to be about 4 *deg.* & an halfe, and his latitude in like ſort to bee almoſt 5 degrees Southwards from thecliptick, for all the Starres which haue North latitudes, euen the one halfe of the globe are in this *Aſtrolabe* comprehended within the *Zodiacke*.

Then do but apply the Noone line of the *Zenitfer* as before prepared, vnto the middle pricke or centre of this ſtarre *Oculus tauri*, it ſhall there ſhew you in the *Maters* limbe 62. *deg.* and better his right aſcention and in thecliptické circle foure degrees and better in ♊ his *deg.* of culminacon as in the 8 *cap.* and in the hower circle almoſt halfe an hower paſt 4 of the clock after-noone the time when as hee ſhall that day culminate or come vnto the meridian in the South part, as in the 16 *cap.* And thus much the bare line ſheweth you. Now do but marke what point or radiall degree of the nooneline cutteth vppon the middle pricke of the Starre, & that point ſhall play as good a part, for if you reckon that point or degree according to the numbers ſet on the noone line, you ſhall find it 16 *deg.* and better, and ſo much is the declination of *Oculus Tauri* as in the 8 *cap.* and that Northwards from *thequinoctiall* circle becauſe hee is within it. Then reckon by the radiall de. on the nooneline counting them from the vertical lidger (ſet co the latitude as before) til you com to that 16 degree ouer the cnetre of the ſtar, you ſhall finde them amount to 36, & ſo much

will

wil his diſtance from our *Zenith* be, when he commeth to the meridian, which 36 deg. taken out of 90 leaueth 54 degrees his Meridian altitude as in the 16 *cap.* And if you turne about the *Zenitfer* till the Northline of *Media nox* come on this ſtarr, ſo ſhall the nooneline alſo (whoſe office alone is now to ſhew the howers) ſhew you halfe hower paſt 4 in the morning and better, the iuſt time when as *Oculus Tauri* ſhall come vnto the Meridian in the North vnder the earth. And now if you liſt to remoue the hower circles, *Index* from daye to day the noone line (reſting ſtill on the ſtarre) may ſhew you what hower that *Oculus* ♉ cōmeth to the Meridian euery day of the yeare.

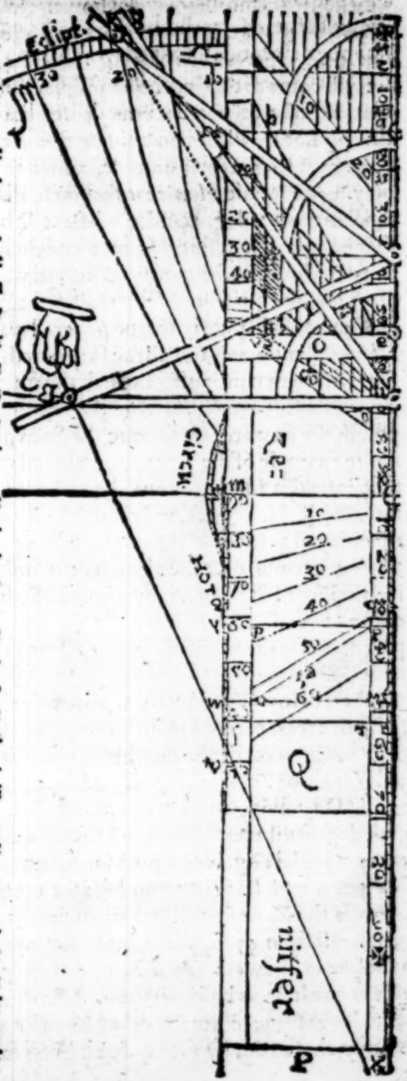
And as all thoſe Meridian concluſiōs, (as I may terme them) are ſoone had by bare inſpectiō without mouing. So you may as redily attaine al the Horizontall concluſions with a verie eaſie kinde of motion: but euē with leading about the *Zenitfer* by the *Almicantifer*, as one ſhoulde leade a horſe by the halter rounde about an horſe mill, and all the ſkill is but to knowe which way to leade him, for if your queſtion propoſed bee, to bee performed on theſt halfe of the Horizon, which I call the Eaſt hemiſphere (for the Meridian or nooneline alwaies deuideth euery Horizon in two equall parts) then muſt your *Almicantifer* play on the Eaſt or left ſide of the nooneline where *Oriens* is written, and leade him about leftwards till the pointer touch vpon the planet or ſtar propoſed, but if on the Weſt hemiſphere then right-wards: as for example, to know what hower the ☉ ſhal riſe the ſaid 5 of March 1598 play your *Almicantifer* in the Eaſt hemiſphere and thereby leade about the *Zenitfer* left-wards till the pointer may be brough to touch the ſaid 25 deg, 5 mi. of ♓ there ſhal the nooneline ſhew you in the hower circle almoſt a quarter after 6 of the clock, the time of ſon riſing that day, and the *Almicantifer* labelled to the Eaſt line of the *Zenitfer*, vz, to *L M* ſheweth as in the 17 Chap. in the Celeſtialls limbe 355 ½ deg. his oblique aſcention for that daye. Then if you liſt to leade him on leftwards till the pointer come to touch the middle prick of *Oculus Tauri*, there you ſhall ſee the nooneline to ſhew in the howercircle a litle paſt 9 in the forenoone the time of his riſing that daye, and the *Almicautifer* labelled or applyed frō *L* on *M*, ſhall ſhew in the *Maters* limbe 41 deg. his oblique aſcention for that day as in the 18 *cap.* And if now you would know what time they will ſet, then play the *Almicantifer* on the Weſt hemiſpheare, and by him leade about the prepared *Zenitfer* right-wards till the pointer do touch eyther of them, and you ſhall ſo finde the nooneline to ſhew for the the ſon almoſt 6 of clock, and for *Oculus Tauri* the times of their ſetting, almoſt 12 at midnight. And the Veſpertine fin of the *Almicantifer G I* applyed to *L M* ſo ſhall the fiducyall ciall line *G P F* of the *Almicantifer* which repreſẽteth now the Weſt lyne ſhewe in the *Maters* limbe the 154 ½ deg. and for the ſtarre 86 deg. their oblique deſcentiõs for that day. Then if you reckon the howers betwene the Son riſing and ſetting the ſame is the length of the day, and theſe taken out of 24 leaueth the length of the night alſo, the howers betweene the riſing & ſetting of *Oculus Tauri* are called his dinruall arch, thoſe taken out of 24 leaueth his *Nocturnall* arch. Likewiſe the right aſcention of *Oculus* ♉ being as before 62 deg. and nowe his oblique aſcention found 41 degree take the bigger out of the leſſe there reſteth 21 deg. his difference of aſcention in this 52 latitude from that of the right *Horizon*.

The Third difficultie and materiall matter is as it ſeemeth for any latitude aſſigned to prepare the *Zenitfer* to any Altitude taken, taught in the 13 Cap. thereby to knowe what hower of the day or night it is and ſuch like queſtions. Let your lydgers lye ſtill vnremoued ſo long as your queſtions keepe in that latitude, whereunto they are placed. And admit then you had taken the altitude of the Son 25. deg. the 2 of *October* 1596. in the Morning (the *Index* of the hower circle being ſet as now is taught to the ſame degree of the Son in Thecliptick at *K* vz. euen with the prickt line *L K*. First you ſhall here ſeeke on the 52 *Zenith* line *B F*, for the 25 *Almicantare* roote which according to their nūbers ſet in the left margent of the *Zenitfer* you ſhall finde at the point *A* of the line *B F*, whereunto you ſhall now apply the fiducyall line of the Curſor which ſhall then cut the 25 radiall deg. of the nooneline marked with *C* (but of that 26 radiall deg. there is no vſe) and there let the Curſor be ſet faſt, then extẽd the *Almicantifer* euen by the nooneline and ſlyde downe the poynter till it do touch the 25 North degree that is to ſay, at the 25 radiall degree, reconed from the *Horizontall* lydger at *R* towardes the centre *L* (and beyond if neede ſo requier as here it doth not) which will here fall out at the 37 rad. deg. according to the numb. ſet on the North line at the letter *Q* but thoſe numbers as I ſayde are not much to bee regarded after your lydgers are ſet. And your Curſor thus planted at *D C* and the poynter diſtaunt from *C* according to the quantitye *C Q* ſo is your *Zenitfer* prepared for that 25 altitude in this 52 latitude. Nowe therefore becauſe the Altitude taken was in the morning, play your *Almicantifer* on the Eaſt hemiſpheare, and by him lead aboute the *Zenitfer* left-wardes till the poynter come vppon the Sunnes place in thecliptick at *K*, ſo ſhall the nooneline *L C A* there preſentlyẽ ſhewe you in the hower-circle 10 of the clocke the hower ſought for without any labelling to the ☉. But yf you will labell the hower becauſe the Booke ſheweth ſo: then bringe downe the fiducyall line of the Curſor to the centre *L* the *Zenitfer* ſtill remayning where he was, and there the *Almicantiſer* labelled to the Sun at *K* ſhall ſhew you in the hower quadrant of the Curſor 10 of the clocke *Antemeridian* euen as the Noone-lyne doth on the hower-circle.

☞ To performe the 15 Chap. applye the Noone-lyne to the ☾ and from thence reckon in the hower-circle ſet, ſo many howers eyther rightwardes or left-wardes according as you finde the hower giuen by his ſhade, diſtante from the *Index* and at the end of that reckoning is your deſire.

Now to the example of the 23 *cap.* yf you plant the noneline on the great Starre *Oculus Tauri*, the howercircles *Index* planted at 26 *deg.* 3 min. of ♓ ſeeke thereon, 10 of the clocke at night the hower giuen and thence reckon thereon the howers vnto the noone lyne, you ſhall finde then $5\frac{2}{3}$ howers thoſe ſhall be the hower diſtaunce of *Oculus Tauri* from the South there ſought, and that Weſtwards becauſe the reckonning goeth Weſtwards from 10 of the clocke.

Next to the 24 *cap.* the howercircles *Index* planted (for ſtill that muſt firſt be done) at 20 de. 10 min. ♎. In ſteed of labelling to thee ☉ you ſhall applye the nooneline to 10 of

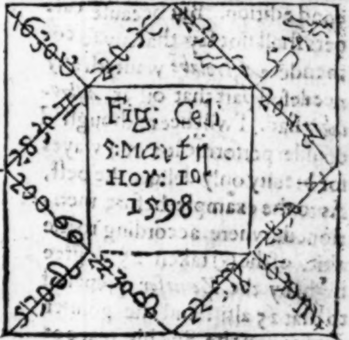


the clocke

clocke in the morning, in the hower-circle, and there holding ſtill the *Zenitfer*, prepare it as before is taught to ſome altitude at auenture, admit to 20 degrees: then playing about the *Almicantifer* if the poynter ſo ſet will come to touch the *Sun* his place or ſtarre propoſed, then bee ſure that altitude prepared is your deſire, but if the poynter ouer reach as at that proffer it will, Then holding ſtill the *Zenitfer* at the hower giuen, prepare it to a greater altitude, admit to 25 deg. at auenture, and then playing about the *Atmicantifer* you ſhall find the poynter to cut the eclipticke in the 20 deg. 10 min. of ♎ at *K* being the Sonnes true place for that inſtant. Therefore you may conclude that the 10 of *October* 1596 at 10 of clocke in the morning the Son was 25 deg. high in our 52 latit, yf 25 had not hit you muſt haue aſſaied againe if neede had been.

The laſt difficultie is for the generall waye to get the 12 houſes in the 27 cap. mentioned, and all the ſkill reſteth but in triple, preparing of the *Zenitfer* for that purpoſe, of which the firſt is but the preparing to the *Horizon* as before is taught: And then the noone line layd to the hower propoſed, the howercircle ſet vnto the Sons place in the 25 deg. 3 min. of ♓ in the example of the 27 cap, mentioned vz. vnto 10 of clock, ſheweth in thecliptICke 22 deg. 30 min. the 10 houſe, and the North line 22 deg. 30 min. of ♌, the 4 houſe, and there (the *Zenitfer* holden ſtill) the *Almicantifer* played in the Eaſt Hemiſphere, the poynter ſhall cut in thecliptIcke 28 deg. 30 min. of ♊ the aſcendent or firſt houſe, and playde on the Weſt Hemiſphere 28. 30 of ♐ the 7 houſe. So haue you the 4 chiefe *Cardines* of the 12 houſes. And the other 8 are as eaſily had by two other like preparations, for the which there are planted on the *Zenitfer* 60 ſlope lynes called *Domifying* lines, beginning from his centre line *L M*, and thence numbered downewards to 60. And alſo 60 radiall degrees called Domifying degrees, planted in his left margent betweene *M* & *V*, beginning at *V* with 30 & thenſe numbered inwards with ſtanding figures ending at *M* with 90. And vnto theſe 60 Domifying degrees, there are lymitted 60 Domifying roots in the noone line, which are but the double radiall degrees thereof, numbered from the centre outwards, that is to ſaye euery 2 radial deg. accempted but for one Domifying roote and euery 10 but 5 &c. and ſtanding numbers ſet vnto them accordingly, of which becauſe the *Zenitfer* yeildeth not ſuffitient, therefore I haue now ſupplyed the reſt from 45 forwards, in the *Almicantifer* as farre as it will ſtretch as before is ſhewed. And as one of the 90 *Zenith* lines ſerueth all the vſes in one latit. as before is ſhewed. So one of theſe 60 Domifying lynes ſerueth the turne to get the other 8 houſes at all times in one latit. which is eaſily choſen out by the ſayd numbers aſcribed vz. *P O* for the 52 latit.

Theſe thinges knowne, then to performe the ſecond preparation which ſhal get you the 2.8.6.& 12.houſes is thus done: Remoue the *Horizontal Lidger* vnto *O* the outer end of the 52 Domiſying line, which ſhal cut the North line at *T*, & among the Domiſying degrees 42 $\frac{1}{2}$ at *W*: there, at *T.O.W.* let the lidger reſt & plãt the Curſor at the like number of the ſaid Domiſying roots in the noone line, vz. at the 42 $\frac{1}{2}$ Domiſying roote which will fall out at the 5 $\frac{2}{3}$ rad. deg. from the + at *Z* there faſten the Curſor & applying the *Almicantifer* euen by the noone line ſlip downe the pointer to the point *T*, & there faſten him. And thus (the *Horizontall* lidger planted to *T O W* & the Curſor to *Z* and the pointer diſtant frõ *Z* to the quãtity *Z T*) is your *Zenitfer* prepared for getting thoſe other 4 houſes. The *Zenitfer* all this while ſtãding ſtill at 10 of clock: but now is twiſe to bee remoued, firſt two howers leftwards vz, to 12 of clocke where the *Index* ſtandeth. And there the *Almicantifer* played about, his pointer ſhall cut the ecliptícke in the Eaſt Hemiſphere at 16 30 of ♉ for the 12 houſe & in the Weſt Hemiſphere, at 16 30 of ♏ for the 6 houſe. Then remoue againe the nooneline two howers rightwards from 10 of clocke vz, vnto 8 of clock, & there the *Almicãtifer* plaid about the pointer ſhal cut in the Eaſt Hemiſp. the 20 deg. of ♋ for the 2 houſe & in the Weſt Hemiſphere the 20 of ♑ for the 8 houſe. So haue you 8 of your 12 houſes to be ſet in your figure or ſcheme drawn as the maner is here preſent for you to ſee, which had. Nowe you muſt againe thirdly prepare the *Zenitfer* to the inner end of the 52 domiſiing line thus: by remouing the *Horizõtall* lydger vnto *P*: which ſhall there cut in the left margent the 57 $\frac{2}{3}$ Domiſying degree at *Y*, and therefore you ſhall plant the Curſor vnto the 57 $\frac{2}{3}$ Domiſying roote in the noone-line which will fall out at the 52 $\frac{1}{3}$ rad. deg. beyond the + and thence ſlide downe the pointer to the lidger at *P*, and ſo is the *Zenitfer* prepared to get the other 4 houſes yet wãting by help of two other remoues, vz. you ſhall now firſt plant his nooneline at 4 howers leftwards of 10 of clocke, vz. at 2 of clocke & there playing the *Almicantifer* about, it ſhall ſhew in the Eaſt Hemiſp. 22 deg. of ♓ for the 11 houſe, and in the weſt *Hemiſp*, 22 of ♍ for the 5 houſe. That done remoue the nooneline 4 howers rightwardes from 10 of clock vz.



to 6 of clock and there playing the *Almicantiſer* about, the poynter ſhall cut in the Eaſt Hemiſp. 3. 30 of ♌ for the 3 houſe & in the weſt Hemiſp. 3. 30 of ♒ for the 9 houſe: Now place thoſe 4 houſes alſo as in this figure you ſee and you haue done. Note that becauſe in the 27 cap. theſe 4 remooues of the nooneline are done by applying the pointer prepared vnto the *Horizontall* pointe pitched in the Celeſtiall, and this way there but barely touched. I thought good to ſhew it now at large leauing euery man to do it which way he beſt affecteth. Note alſo that when the Domifying roots are gone out of the *Zenitfer*, thē ſet the Curſor to the + in the nooneline and there extende the *Almicantiſer* outwardes euen with the noonline where faſtening him with ſome deuiſe you may then hitch a thread and perle to the pointer, and vſe the pointer in ſtede of the Curſor and the thred & perle in ſteede of the *Almicantiſer* and poynter,

LAST of all for *Addition* in the vſe, take one deuiſe more with you for the *Azmuth* then before I wrate of: which with no ſmall ſtuddie I attayned, meaning to haue reſerued it with diuers other propoſitions that I haue in ſtore for a ſecond edition. But becauſe carpets ſhall not ſay that my ſo cōmende *Aſtrolabe* wanteth any needefull part that other *Aſtrolabes* had. I will heere though I coulde performe it 2 or 3 wayes for breuity only deliuer the beſt. As to the example before mentioned, where according to the altit. of the ☉ taken 25 degree high by the *Zenitfer* prepared to that 25 altit. and the pointer applyed on the Sun his place at *K*, his nooneline ſhewed in the howercircle 10 of clock. There holde faſt the *Zenitfer* till you haue done, if you deſire alſo to know what *Azimuth* the ☉ was then in. And play about the *Almicantiſer* (it is no matter on which ſide of the nooneline) till it will meete at *G*: laſtly with the pearle (prepared as before) of the thread faſtned in the loope of the *Azimuthall* ledger at *X* their hold alſo faſt the thred *X G*. Thē apply the fiducyall line of the *Almicantifer* euen with the fiducyal line of the *Curſor* ſquare croſſing the *Zenitſer*: And ſo ſlyde the ſquare down together til the *Almicātifer* cut the perle at *G* which wil be at *H*. in the nooneline, & there at *H*. faſtē the *Curſor* & ſlide the poynter to *G*. & thē vnhitch the thred frō *X* & hitch it to the vertical ledger at *E*, & from *E* extend the thread on the Suns place at *K*, laſtly playe about the *Almicantifer* till the poynter ſetled at *G* as before do touch the Verticall thread *E K*, which will be at *I*. *H I*. being equall to *H G*. So doth *H I*. the fiducyall line of the *Almicantifer* cut amonge the *Antemeridian* degrees of the Curſors *Azimuthall* quadrant, 57 deg. the *Azimuth* ſought for. That is to ſay, the degrees cut are to be taken by the outer numbering being it was in the morning becauſe the *Azimuthes* are numbered from the Eaſt and Weſt pointes of the Horizon either-way vnto the *Meridian* there ending at 90, which is to be regarded by the letter *P* on the *Almicantifer*.

And out of this propoſitiō (becauſe we will leaue no hard chap. of the booke vnexplaned) you may eaſily learne how to performe the 20 chap. another way. For by another *Synonomy* of ſpeech to know the amplitude of riſing and ſetting of the Sun, or ſtars, is but to know vpon what *Azimuth* or point of the compaſſe they riſe. Wherefore being that the Horizon circle of any place *is* the begining of the firſt circle of altititude that is to ſay, of the 0 *Almicātare*. Therfore to get this amplitude, you muſt firſt prepare your *Zenitſer* to that 0 altitude, that is to ſaye, to the Horizon as before is taught by ſetting the Curſor to *A D*. and the pointer to *R*. frō *A*. And being ſo prepared, if it be for ſonne riſing let the *Almicantifer* playe in the Eaſt Hemiſphere, and his pointer there touching the Suns place, hold faſt the *Zenitſer* till you haue all done, whoſe noone-lyne ſheweth in the hower-circle his hower of riſing. Then for the *Azimuth* work in all reſpects as is done laſt before, and you ſhall find the meeting of the pearle and pointer at *G*. will fall out in the centre line *L. M*. extended. Wherefore if a thread were hitched in the centre *L*. and his pearle extended beyond *M*. to that croſſing at *G*. the Curſor neede not here bee remooued at all from *A. D.* when the one threade is extended out of the Verticall point *E* on the ☉ & this thred out of *L*. till his perle cut that vertical thred as before he did at *I*, this centre thred ſhall ſhew in the limbe of the Celeſtiall the amplitude deſired,

[illegible] of clock, [illegible]
[illegible], if it were extended.

Note that if any man ſhall affect to haue the howre circle on the *Zeniſer* according to the firſt direction; and not on a plate or flat by it ſelfe as now I appoint him. Yet let him quite cut away the *Pomeridian* howers which are without the *Zeniſer* numbered from noone vnto [illegible], to the end that nothing may hinder the ſight of the whole *Hemiſphere* at all times and that the Curſor maye alwayes haue free paſſage to the centre. And then to vſe in ſteede of the centre thread a rule or labell, like vnto the *Almicantiſer* before deſcribed, with the Veſpertine ſin on [illegible] ſo ſhall the rule ſhew the *Antemeridian* howers from midnight to [illegible] and the ſin the *Pomeridian* from noone to midnight, and all by that one halfe hower circle deſcribed on the *Zeniſer* euen as before it was done on the quadrant with three ſinnes, and as readily as in the booke by the whole circle.

FINIS.

Faultes eſcaped in the Booke.

In the 9 Chap. 2 line, for paſſeth by the Zenith. Reade *paſſeth frõ the Pole by the Zenith.*

In the 18 Chap. the 18 & 22 line, for 280 & 19. Reade 180 *and* 29.

In the 27 Chap. line 61, *for Inner end.* Reade *outer ende.*

Ibidem line [illegible] *for outer ende.* Reade, *Inner ende.*